AS1 (Assignment 1, Unit 3): Z-scores and Probability

Please type your answers in red

- What information is provided by the sign (+/-) of a *z*-score?

If the z-score is positive, it indicated that the x-score will be above the mean. And, if it is negative then the x-score will be below the mean.

- What information is provided by the numerical value of the *z*-score?

It tells you the distance the x-score is located from the mean in units of standard deviation.

- A distribution has a standard deviation of $\sigma = 10$. Find the *z*-score for each of the following locations in the distribution.

- Above the mean by 15 points.
  Answer: ____1.5_____

- Above the mean by 25 points.
  Answer: _____2.5_____

- Below the mean by 20 points.
  Answer: _____-2_____

- Below the mean by 5 points.
  Answer: _____-0.5_____

- For a distribution with a standard deviation of $\sigma = 12$, describe the location of each of the following *z*-scores in terms of its position relative to the mean. For example, = +1.00 is a location that is 12 points above the mean.

- $z = +2.00$ Answer:_____24_____

- $z = +.50$ Answer: ____6_____

- $z = -1.00$ Answer:_____-12_____

- $z = -0.25$ Answer:_____-3_____

- For a population with $\mu = 70$ and $\sigma = 10$,

a. Find the *z*-score for each of the following X values. (Note: You should be able to find these values using the definition of a *z*-score. You should not need to use a formula or do any serious calculations.)

X = 75: z = __0.5___ X = 100: z = __3__ X = 60: z = __-1___

X = 95: z=___2.5___ X = 50: z =__-2____ X = 85 z = __1.5____

- Find the score (X value) that corresponds to each of the following *z*-scores. (Again, you should not need a formula or any serious calculations.)

z = 1.00: X= __80__ *z* = 0.20: X=__72____ *z* = 1.50: X= __85__

z = -0.50: X=__65___ *z* = -2.00: X= ___50___ *z* = -1.50: X=__55___

- For a population with a mean of $\mu = 40$ and $\sigma = 12$, find the *z*–score for each of the following X values. (Note: You probably will need to use a formula and a calculator to find these values)

X = 45: z =__0.42___ X = 52: z =__1__ X = 41: z =__0.08___

X = 30: z =__-0.83___ X = 25: z =__-1.25___ X = 38: z =__-0.17___

- For a population with a mean of $\mu = 100$ and a standard deviation of $\sigma = 10$,
  - Find the z-score for each of the following X values.

X = 108: z =__0.8___ X = 115: z =__1.5___ X = 130: z =__3__

X = 90: z =__-1___ X = 88: z =__-1.2___ X = 95: z =__-0.5___

- Find the score (X value) that corresponds to each of the following z-scores.

z = -0.40: X=__96____ *z* = -0.50: X=___95___ *z* = 1.80: X=___118___

z = 0.75: X=__107.5____ *z* = 1.50: X=__115____ *z* = -1.25: X=__87.5____

- A population has a mean of $\mu = 70$ and a standard deviation of $\sigma = 12$.
- For the population, find the z-score for each of the following X values.

X = 69: z =__-0.08___ X = 84: z =__1.17___ X = 63: z =__-0.58___

X = 54: z = __-1.3___ X = 48: z = __-1.18___ X = 45: z = __-2.08___

- For the same population, find the score (X value) that corresponds to each of the following z-scores.

z = 0.50: X=__76___ *z* = 1.50: X=__88___ *z* = -2.50: X=__40___

z = -0.25: X=__67___ *z* = -0.50: X=__64___*z* = 1.25: X=__85___

- A sample has a mean of M = 30 and a standard deviation of s = 7. Find the z-score of for each of the following X values from this sample.

X = 32: z = __0.29___ X = 34: z = __0.57___ X = 36: z = __0.86___

X = 28: z = __-0.29___ X = 20: z = __-1.43___ X = 18: z = __-1.71___

- A sample has a mean of M = 35 and a standard deviation of *s* = 5. For this sample, find the X value corresponding to each of the following *z*-scores.

z = 0.40: X=__37___ *z* = 1.20: X=__41___ *z* = 2.00: X=__45___

z = -0.80: X=__31___ z = -0.60: X=___32__*z* = -1.40: X=__28___

- Find the z-score corresponding to a score of X = 45 of the following distributions.

  - $\mu = 40$ and $\sigma = 20$
    Answer: _____*0.25*_____
  - $\mu = 40$ and $\sigma = 10$
    Answer: ____*0.5*_____
  - $\mu = 40$ and $\sigma = 5$
    Answer: _____*1*_____
  - $\mu = 40$ and $\sigma = 2$
    Answer: _____2.5_____

  Find the X value corresponding to z = 0.30 for each of the following distributions.

  - $\mu = 40$ and*d* $\sigma = 4$…….Answer:

_____41.2_____

- $\mu = 40$ and $\sigma = 8$…….Answer: _____42.4_____

- $\mu = 40$ a*nd* $\sigma = 16$……..Answer: _____44.8_____

- $\mu = 40$ and $\sigma = 32$……Answer: _____49.6_____

- For each of the following populations, would a score of X = 50 be considered a central score (near the middle of the distribution) or an extreme score (far out in the tail of the distribution)?

  - $\mu = 45$ and $\sigma = 10$……..Answer: _____central_____

  - $\mu = 45$ and $\sigma = 2$……..Answer: _____extreme_____

  - $\mu = 90$ and $\sigma = 20$……..Answer: _____extreme_____

  - $\mu = 60$ and $\sigma = 20$……..Answer: _____central_____

- A distribution of exam scores has a mean of $\mu = 78$.

  - If your score is X = 70, which standard deviation would give you a better grade: $\sigma = 4$ or $\sigma = 8$?
    Answer: _____8_____

  - If your score is X = 80, which standard deviation would give you a better grade: $\sigma = 4$ or $\sigma = 8$?
    Answer: _____4_____

- For each of the following, identify the exam score that should lead to the better grade.

  - A score of X = 74 on an exam with M = 82 and $\sigma = 8$; or a score of X = 40 on an exam with $\mu = 50$ and $\sigma = 20$.

Answer: a score of X = 40 on an exam with $\mu = 50$ and $\sigma = 20$.

- A score of X = 51 on an exam with $\mu = 45$ and $\sigma = 2$; or a score of X = 90 on an exam with $\mu = 70$ and $\sigma = 20$.

Answer: A score of X = 51 on an exam with $\mu = 45$ and $\sigma = 2$

- A score of X = 62 on an exam with $\mu = 50$ and $\sigma = 8$; or a score of X = 23 on an exam with $\mu = 20$ and $\sigma = 2$ Answer: Both have a z score of 1.5

15. A population consists of the following N = 5 scores: 0, 5, 4, 4, and 12.

a. Compute μ and σ for the population

Mean =_____5_____ Standard deviation=_____4_____

b. Find the *z*-score for each score in the population
X=0, z =___-1.25___ X=5, z=__0____ X=7, z=__0.5___ X=3, z=__-0.5___ X=12, z=__1.75___

- A sample consists of the following $n = 7$ scores: 5, 0, 4, 5, 1, 2, and 4.
- Compute the mean and standard deviation for the sample.

Mean =____3_____ Standard deviation =_____2_____

- Find the *z*-score for each score in the sample.

X=5, z=__1___ X=0, z=___-1.5__ X=4, z=___0.5___ X=5, z=___1___ X=1, z=_-1___
X=2, z=__-0.5__ X=4, z=__0.5___

- There are 40 black marbles, 20 blue marbles, and 4 red marbles in a jar.
    - What is the probability of selecting one red marble? _____4/64_____
    - What is the probability of selecting one black marble? _____40/64_____
    - What is the probability of selecting one blue marble? _____20/64_____
    - Which has the highest probability of being selected? _____black_____
    - Which has the lowest probability of being selected? _____red_____
- Probability values range from _____0 (0%)_____ to ____1 (100%)_____.
- Please describe at least three characteristics of the NORMAL DISTRIBUTION
    - Shape is symmetrical
    - mean, median, and mode are all located in the center, all equal
    - More scores located in the center and less and less out to the sides.
- In a normal population of IQ scores, what percent of people have "average" IQ's?

Answer 68%

- In a normal distribution, what percentage of people would be located at or below 2 standard deviations from the mean?

Answer 2.28%

- Answer the following questions based on a distribution with a $\mu = 25$ and $\sigma = 4$:
    - What range of scores is considered "average"? _____21_____ to _____29_____
    - What percentage of people has an average score?

_____68%_____

- What percentage of people has extremely high or extremely low scores? ___2.28%_____

- What *range of scores* (requires numbers to be noted in the blank spaces) have the highest probability of being selected? ____21_____ to ____29_____